

Retail and Place Attractiveness: The Effects of Big-Box Entry on Property Values

Sven-Olov Daunfeldt^{1,2}, Oana Mihaescu¹, Özge Öner^{3,4,5}, Niklas Rudholm¹

¹Institute of Retail Economics (HFI), Stockholm, Sweden, ²Dalarna University, Falun, Sweden, ³Department of Land Economy, University of Cambridge, Cambridge, UK, ⁴Research Institute of Industrial Economics (IFN), Stockholm, Sweden, ⁵Centre for Entrepreneurship and Spatial Economics, Jönköping International Business School, Jönköping, Sweden

The opponents of big-box entry argue that large retail establishments generate a variety of negative externalities. The advocates, on the contrary, argue that access to a large retail market not only delivers direct economic benefits, but also a variety of positive spill-over effects, and therefore, can be considered a consumer amenity that increases the attractiveness of the entry location. To test the validity of these competing arguments, we use the entry of IKEA in Sweden as a quasi-experiment and investigate if increased access to retail is associated with place attractiveness, where attractiveness is proxied by residential property values. We find that entry by IKEA increases prices of the properties sold in the entry cities by, on average, 4.2% or 62,980 SEK (approximately 6,600 USD), but such an effect is statistically insignificant for the properties in the immediate vicinity of the new IKEA retail trade area. We also observe an attenuation of the effect with distance from the new IKEA store, where the properties located 10 km away experience a 2% price increase. Our results indicate that large retailers have the potential to increase place attractiveness, but perhaps not in the immediate vicinity of the new establishment.

Introduction

Amenities are place-specific assets that increase the attractiveness of a location. Traditionally, the urban and regional economics literature has focused on investigating the impacts of exogenous amenities such as clean air, green space, or coastal borders. More recent studies have focused on the importance of man-made amenities as important place attractors, such as arts and entertainment facilities, museums, and night life, all of which are endogenous in nature (Brueckner, Thisse, and Zenou 1999; Glaeser, Kolko, and Saiz 2001; Florida, Mellander, and Stolarick 2008; Partridge et al. 2008).

Whether retail trade may be considered an endogenous amenity is a controversial topic. While some researchers argue that access to retail trade has positive effects on place attractiveness

Correspondence: Özge Öner, Department of Land Economy, University of Cambridge, 16-21 Silver Street, Cambridge CB3 9EP, UK
e-mail: oo263@cam.ac.uk

Submitted: August 4, 2019; Revised version accepted: May 27, 2020

doi: 10.1111/gean.12247

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(Öner 2014, 2017), opponents argue that large retail areas, in particular big-box retailers, are associated with environmental and esthetic degradation, increased noise and light pollution, garbage accumulation, traffic congestion, and increase in local crime (Corlija, Siman, and Finke 2006; Pope and Pope 2015; Sale 2015). These negative externalities may decrease the willingness of residents to pay for location in the neighborhood of big-box retailers, which means that it is not clear whether the total impact of increased access to retail trade on place attractiveness is positive. However, both positive and negative externalities are capitalized in property values (Kuethe and Keeney 2012), making them an appropriate proxy for place attractiveness.

We use entry of IKEA into five local markets in Sweden as a quasi-natural experiment to explore how a significant increase in access to retail trade is associated with place attractiveness, proxied by residential property prices. A new IKEA retail area is often the largest retail establishment ever to enter a city, which means that it can be considered a positive supply shock that improves a place's rank in the regional hierarchy by attracting consumers from longer distances, thus, extending its market boundary. If access to retail can be considered an amenity, entry of IKEA should provide an immediate and accentuated effect on residential property values.

Most previous studies on how big-box retail entry affects local markets have focused on its impact on other outcome variables such as local business sustainability, employment levels, and revenues (e.g., Barnes et al. 1996; Artz and Stone 2006; Basker 2007; Jia 2008; Neumark, Zhang, and Cicarella 2008; Haltiwanger, Jarmin, and Krizan 2010). Daunfeldt et al. (2017) have previously used the entry of IKEA as a quasi-natural experiment, finding that it increases total durable goods sales and employment in the municipality, while the effects in the neighboring municipalities are small and, in most cases, insignificant. These results are, however, based on aggregate data for the municipality and include the sales and employment of IKEA itself. Other studies have found that new IKEA retail areas also creates positive spillover effects on nearby retailers (Daunfeldt et al. 2016; Han et al. 2018; Håkansson et al. 2019), although these positive spillover effects seem too small to motivate the substantial investments that local policymakers often undertake to attract IKEA to the region.

Nevertheless, the effects of large retailers on property values have been largely left unexplored, and the results from the few previous studies that have focused on this relationship are ambiguous. While some find positive effects of large establishments on property values (Sirpal 1994; Pope and Pope 2015; Van Fossen 2017; Slade 2018), others find negative effects (Corlija, Siman, and Finke 2006; Johnson et al. 2009), and some find no effects at all (Loyer 2010). Consequently, we still lack knowledge on whether big-box retail entry increases the long-term attractiveness of the place.

The wide variation in the observed effects from an entry by a large retailer on property values might be due a lack of a robustness in methodology. Identifying the effect of increased access to retail trade on place attractiveness is not an easy task because the size of the local retail market is not orthogonal to the size and characteristics of the consumer base. Large local markets have a higher demand base, which in return dictates the size of the local retail market, both of which are correlated with the property prices. Such simultaneity makes it empirically challenging to distinguish the effect from higher access to retail trade from the effect from the sheer market size.

Previous studies are often based on hedonic price models executed with cross sectional data, which means that they cannot investigate the relationship between the establishment of a big-box retailer and its effects on property values. Some of the more recent studies also fail to control for spatial and temporal heterogeneity, and the results they observe—or parts of it—may be driven by a potential omitted variable bias. Some notable exceptions are Pope and Pope (2015) and

Slade (2018), who found positive results of large retail entry on property values when using a difference-in-difference model and conducting the analysis at a more disaggregated geographical level. However, both of these studies investigate the effects when Walmart entered local markets in the United States, offering no insights for the effects of other type of retailers. The effect of Walmart has been shown to be highly localized (Pope and Pope 2015; Slade 2018); meanwhile, higher order retailers (such as IKEA) are known to have wider markets (Christaller 1933; McCann 2001) and their effects may differ in both magnitude and spatial extent from those of grocery-based retailers such as Walmart.

We contribute to the literature by investigating how property values, as strong proxies for place attractiveness, are affected by a sudden and significant expansion in the local retail market following the entry by IKEA in five Swedish cities. The entry by IKEA is, thus, used as a “shock” in retail accessibility on the local markets it enters. To mitigate any possible geographical heterogeneity, we follow Pope and Pope (2015) by estimating the posttreatment effect within the city that IKEA enters, making it possible to investigate how the effect of IKEA on residential property prices in the entry cities varies with the distance from the entry location.

Our results indicate a nonlinear association between IKEA entry and residential property prices, in the form of an inverse U-shape with a long tail (Fig. 3). As such, we find that entry by IKEA is associated with a price increase of the properties sold in the entry cities by, on average, 4.2% or 62,980 SEK (6,600 USD). The properties closest to the new IKEA retail area are not affected by the entry of IKEA, while properties located at 1.5 km away experience an average price increase of 6.55%. The estimated effect of IKEA entry on residential property prices reaches a maximum (6.65%) at about 2 km from the entry location, and then, decreases smoothly to about 2% at 10 km distance from the new IKEA retail area. A possible interpretation of our results is that the positive and negative externalities from a large retail establishment like IKEA cancel each other out within close proximity of the new store, but while the negative externalities are rapidly decreasing with distance, the positive are not.

Several studies (Corlija, Siman, and Finke 2006; Aliyu, Kasim, and Martin 2011) report similar patterns, with no or even negative effects close to the entry sites, then, turning positive and increasing up to some maximum value, after which the impact decreases with distance. As for the size of the effect, our results regarding the average impact in the entry cities, occurring at 4.5 kilometers (approximately 3 miles), with a positive impact of 6,600 USD are in line with the 7,000 USD effect of Walmart establishments reported by Pope and Pope (2015) for properties within half a mile of a new Walmart, and the 6,000 USD effect per additional supermarket within a 3-mile radius of the analyzed neighborhoods reported by Van Fossen (2017). A difference between our study and most previous studies is, however, that the effects have a slower distance decay and does not turn zero within the entry cities. As such, it seems that a higher order retailer like IKEA has an impact on residential property values in a larger part of the local market than does a new Walmart or supermarket.

The following section explains the theoretical background of our analysis. Section 3 is focused on a survey of previous studies, while Section 4 describes the data and the methodology of our research. The results are presented in Section 5, while the last section concludes and discusses policy implications and limitations with our study.

Theoretical framework

A series of factors have led to the rise in the number of large retail areas located on city outskirts, and in the number of consumers patronizing these areas over the last decades. The possibility

of establishing shopping areas outside the city limits originates in the increased access to and use of cars, which contributed to improved mobility (Forsberg, 1998). Meanwhile, the increased participation of women in the workforce has considerably raised the purchasing power of the households. As the economy has evolved toward what is called “the experience economy,” more value is derived from the experience of consuming a product compared to the actual value of the commodity (Pine and Gilmore 1999; Öner 2014, 2017). The consequence of these factors has been an increased demand for and patronage of large shopping centers, most of which are located outside the city limits and include one or several big-box retailers.

Agglomeration theories provide a solid argument for why such large retailers may impact the attractiveness of their entry places and how this is capitalized in property values. Large retail establishments exert both positive and negative externalities in their entry locations, for example, regions. The positive externalities are due to an increased level of convenience generated from easy access to shopping and entertainment facilities (Des Rosiers et al. 1996). The argument of the traditional location theories (i.e., Weber 1929; Christaller 1933; Lösch 1954; Isard 1956) is that large and dense markets become more attractive to consumers than smaller and less dense counterparts. This is due to a series of individual advantages related to augmented possibilities for comparison and one-stop shopping, which help minimize shopping time, costs, and uncertainty, and thus, increase individual utility. Co-location of retailers selling substitutes establishes the basis for comparison shopping (Han et al. 2018; Håkansson et al. 2019), and thus, contributes to increasing the allure of a retail area as households are attracted by the possibility of minimizing shopping time, costs, and uncertainty. A retail cluster including several furniture stores increases, for example, the possibility of finding the desired furnishings quickly and presumably cheaper. The prospect of minimizing shopping time and costs for the basket of desired products is also a convenience of multipurpose shopping, which is an outcome of co-location of retailers selling complements and contributes to attracting customers to the respective retail area as well (Brown, 1989; Chung and Kalnins 2001). Customers of furniture stores are likely to spill over to, for example, grocery stores, if these are located in the same retail cluster, as they save both time and money by avoiding to travel outside the respective cluster. Mulligan (1983) identifies such savings by way of multipurpose shopping in a modeling approach that ties neoclassical demand theory to a spatial framework. Some but a limited portion of these savings can potentially be directed toward housing consumption, which may affect housing price elasticities nearby the retail trade area that offers variety. Spatial preferences of consumers based on multipurpose shopping opportunities can, in turn, dictate the optimal producer location (Ghosh and McLafferty 1984; Ingene and Ghosh 1990).

Meanwhile, transportation costs to the retail cluster also play an important role in the determination of land prices (Dicken and Lloyd 1990; Klaesson and Öner 2014). Consumers make longer—more expensive—and thus, less frequent trips for patronizing stores selling high-order goods, such as furniture, whereas they make shorter—cheaper—and more frequent trips to stores selling low-order goods, such as milk and bread. The variation in willingness to travel means that the distance decay is different for different type of retailers. Therefore, depending on the retailer in question, the market reach would also be different. Consequently, stores selling goods for less frequent purchase have a larger market reach than low-order retailers such as grocery stores (Klaesson and Öner 2014; Öner and Klaesson 2017). Berry (1967) building on Central Place Theory can be used to explain the configuration and emergence of trading areas. If the market price of the good combined with the additional transportation cost is not sufficiently low, consumers would choose to shop at a closer retail trade area, which dictates the range of the market for any particular retailer (Parr and Denike 1970).

According to Central Place Theory, entry by IKEA, a large retailer selling high-order goods, should expand the reach of local market and increase its rank in the regional hierarchy by making it relatively more central (Christaller 1933; Lösch 1954). This type of hierarchical order for cities is also evident in retail markets as discussed by Berry and Garrison (1958a, b), where small clusters of retail establishments along the street are followed by neighborhood shopping centers, community shopping centers, and by regional shopping centers. Expansion in market reach implies that customers traveling from further away are now attracted to the larger retail trade area. Locating close to retail agglomerations is thus potentially attractive due to the prospect of minimizing travel costs and maximizing consumer utility, and increased demand may drive land prices up. These positive effects make that retail trade is often regarded as an amenity, a place-specific asset that increases the attractiveness of a location (Öner 2017), and that cities with rich consumption possibilities grow in general faster than their amenity-poor counterparts. Over and above the sheer market size, centrality is a key aspect for the prosperity of retailers. For example for Swedish market, more recent research shows a productivity premium from higher rank in the regional hierarchy for retailers (Öner 2018). Such finding implies that a medium size city can outperform its comparable counterparts in terms of size in another regions, given that it is the central market in its respective regional system of cities.

However, large retail establishments may also be a source of negative externalities due to increased noise and light pollution, garbage accumulation, traffic congestion, and loss of perceived visual esthetics (Pope and Pope 2015; Sale 2015). Several studies have shown that such disamenities are capitalized into housing prices. For example, Smith, Poulos, and Kim (2002) shows that traffic noise can have a negative impact on housing prices. Green Leigh and Coffin (2005), Lim and Missios (2007), Mihaescu and vom Hofe (2012, 2013), and Lin (2013), among others, find that landfills and brownfields negatively affect property values.

The question is then whether the convenience benefits from location in the proximity of a large retail store outweighs the costs imposed by any negative externalities. In other words, does entry by a big-box retailer exert a positive or a negative effect on adjacent residential house prices and is this relationship homogenous over space? If we observe a decrease in housing prices near a big-box store following its entry, this might indicate that there are significant negative externalities imposed on landowners and households. However, if we observe an increase in housing prices, this might signal that the benefits of easy access to shopping outweigh any negative externalities imposed on local residents. Furthermore, any variation in these effects over space indicates whether the value of accessibility increases or declines more or less rapidly across space than the costs of localized externalities.

Empirical studies

Retail decentralization and expansion at large have been explored through the lens of economic geography by a number of studies previously, which mostly deal with the trends in the U.K. market (e.g., Langston, Clarke, and Clarke 1997; Thomas, Bromley, and Tallon 2004; Wrigley et al. 2009). In fact, efforts to empirically examine the impact of major retail developments on economy, for example, other shops, date back as late as the 1970s (see e.g., Guy 1977). We summarize previous studies about the impact of large retail developments on property values in particular in the entry regions in Table 1. The findings are inconclusive. While some studies report increased property values as a possible effect of large retail development (e.g., Sirpal 1994; Des Rosiers et al. 1996; Pope and Pope 2015; Van Fossen 2017; Slade 2018), others have found no

Table 1. Previous Studies on the Impact of Large Retailers on Property Values

Author	Dependent variable	Key Independent Variable	Method	FE	Level of Analysis	Land	Main Result	Spatial Extent of Effect/Selected Sample
Sirpal (1994)	Residential property prices	Size of (3) shopping centers	Cross-sectional OLS	No	Property	US	+, various functional forms	Selected sample: up to 3,000 feet (1 km) from the outer boundaries of selected shopping centers in Gainesville, Florida
Des Rosiers et al. (1996)	Residential property prices	Size and proximity of (87) shopping centers	Cross-sectional OLS	No	Property	Canada	+, various functional forms	Selected sample: Quebec region
Corlija, Siman, and Finke (2006)	Residential property prices	Proximity and construction phase of (1) shopping center	Panel OLS (2000–2004)	Time	Property	US	Inverse-U shape relationship between property prices and distance from shopping center	Selected sample: Maricopa county, Arizona
Johnson et al. (2009)	Residential property prices	Distance to and type of closest big-box (Walmart, Kmart, Target, Best Buy)	panel OLS (1994–2005)	Time	Property	US	–7,000 USD, increasing with distance from Walmart; +29,000–+39,000 USD, U-shape relationship between property prices and distance from Kmart, Target, Best Buy	Selected sample: up to 2 miles (3.2 km) from the big-box stores in El Paso county, Colorado

(Continues)

Table 1. (Continued)

Author	Dependent variable	Key Independent Variable	Method	FE	Level of Analysis	Land	Main Result	Spatial Extent of Effect/Selected Sample
Addae-Dapaah and Lan (2010)	Residential property prices	Distance to the closest (19) shopping center	Pooled OLS (2005–2008)	No	Property	Singapore	+4.7% for flats within 0.5 km of a shopping center; +15% for flats within 0.1 km of a shopping center, decreasing with distance from the shopping center; +6.1% for flats in blocks close to a town center with a shopping mall, as compared to flats in blocks close to a town center without a shopping mall	Selected sample: up to 0.5 km from shopping center in Singapore
Johnson and Lybecker (2010)	Change in residential property prices; change in days on the market	Number of existing and new big-boxes (Walmart, Best Buy) within 2 miles of a sold property; indicator variable (1 if big-box located within different distances from each property); proximity to closest big-box	Panel OLS (1994–2005)	Spatial & time	Property	US	–for the number of existing stores; no significant effect for the number of new stores; –3,200—6,800 USD for new Walmart stores, if property is located between 1.5 and 2 miles (2.4–3.2 km) from the store; no significant effect for the new Best Buy stores; proximity to store is insignificant	Selected sample: up to 2 miles (3.2 km) from the big-box store (increments of 0.1 miles (0.16 km)) in El Paso county, Colorado

(Continues)

Table 1. (Continued)

Author	Dependent variable	Key Independent Variable	Method	FE	Level of Analysis	Land	Main Result	Spatial Extent of Effect/Selected Sample
Loyer (2010)	Total value of residential properties	Entry of (30) new Walmart stores	Panel OLS (1998–2007)	Time	Municipality	US	No significant effect in either entry or in adjacent municipalities	Selected sample: 566 municipalities in New Jersey; entry municipality & nearest adjacent municipality
Aliyu, Kasim, and Martin (2011)	Residential property prices	Distance to (1) shopping center	Panel OLS (2003–2009)	Time	Property	Nigeria	–for properties located within 1,500 feet (0.5 km) from the shopping center; +for properties located further than 1,500 feet (0.5 km) from the shopping center	Selected sample: up to 0.75 miles (1.2 km) from shopping center in Bauchi, Nigeria
Vandegrift et al. (2011)	Total value of residential property prices	Treatment indicator (entry region * period for (30) Walmart stores)	Panel OLS (1998–2007)	Spatial & time	Municipality	US	+5.2% in entry municipality in the second year after entry; no effect in the entry municipality in the first and third year after entry; no effect in the adjacent municipality in the first year after entry; mixed results in adjacent municipalities in the second and third year after entry	Selected sample: 566 municipalities in New Jersey; entry municipality & nearest adjacent municipality

(Continues)

Table 1. (Continued)

Author	Dependent variable	Key Independent Variable	Method	FE	Level of Analysis	Land	Main Result	Spatial Extent of Effect/Selected Sample
Pope and Pope (2015)	Residential property prices	Treatment indicator (entry region * entry period for (159) new Walmart stores)	DiD (1998–2008)	Spatial & time	Property	US	+2–+3% if property within 0.5 miles (0.8 km); +1 - +2% if property between 0.5 and 1 mile (0.8–1.6 km)	Selected sample: up to 4 miles (6.4 km) from opening point, 2.5 years from opening date
Sale (2015)	Residential property prices	Distance to (1) shopping center	Pooled OLS (1995–2009)	No	Property	South Africa	–112.68 ZAR (7.74 USD)* for every 1 meter increase from the shopping center	Selected sample: Walmer neighborhood, Port Elizabeth, South Africa
Van Fossen (2017)	Residential property prices	Number of supermarkets (36,704 in total) within different buffers from each neighborhood	Panel OLS (1997–2015)	Spatial & time	Neighborhood	US	+8,406 USD for every additional supermarket within a 1-mile (1.6 km) radius from the neighborhood; +6,057 USD for every additional supermarket within a 3-mile (3.2 km) radius from the neighborhood; +4,145 USD for every additional supermarket within a 5-mile (8 km) radius from the neighborhood; higher effects for second, third, etc., new stores within every buffer	Buffers: 1, 3, 5 miles (1.6, 3.2, 8 km) around supermarkets

(Continues)

Table 1. (Continued)

Author	Dependent variable	Key Independent Variable	Method	FE	Level of Analysis	Land	Main Result	Spatial Extent of Effect/Selected Sample
Slade (2018)	Residential, commercial, and industrial property prices	Treatment indicator * entry (entry region * entry period for (3,180) Walmart stores)	DID (1990–2015)	Spatial & time	Property	US	+26% within 0.25 miles (0.4 km) of the entry, within 3 years after the open date	Buffers: 0–0.25, 0.25–0.50, 0.50–1 mile (0–0.4 km, 0.4–0.8, 0.8–1.6 km) in 40 metro areas in the United States

*At an exchange rate of 1 USD = 14.45 ZAR, 8 March 2019.

significant relationship (Loyer 2010) or even negative effects (Johnson and Acri née Lybecker 2010). Moreover, the effects of big-box retailers on property values seem highly heterogeneous over space.

On the one hand, both Johnson et al. (2009) and Aliyu, Kasim, and Martin (2011) found a decrease in the price of properties located in the direct vicinity of a new Walmart store. Johnson and Acri née Lybecker (2010), on the other hand, found that new Walmart stores did not affect the properties located in their close vicinity, but determined a decrease of 3,200–6,800 USD in the price of properties located between 1.5 and 2 miles (2.4 and 3.2 km) from the new stores. Other studies reveal the exact opposite, that is, that the positive externalities are stronger than any negative impacts in the immediate vicinity of new large retail establishments (Addae-Dapaah and Lan 2010; Pope and Pope 2015; Van Fossen 2017). Addae-Dapaah and Lan (2010) finds that the price of flats increases by 4.7% for every 1% decrease in distance to the closest shopping center, while Pope and Pope (2015) reports that a new Walmart increases the price of residential properties with about 7,000 USD for properties located within half a mile of the new store. Van Fossen (2017) found that houses benefit of an average premium of about 6,000 USD for every additional supermarket store located within 2 miles (3.2 km) of the analyzed neighborhoods, which decreased to about 4,100 USD for every additional supermarket located within 5 miles (8 km) of the analyzed neighborhoods. Finally, Slade (2018) found that urban land prices increased by 39% over the four-year construction period of the new Walmart stores, and by 26% within three years after their opening date. These positive effects did, however, decreased with distance from the new store.

Further heterogeneity in the results may be introduced by other attributes, such as the size of the center or the size of the entry market. Sirpal (1994) explains that the value of a residential property located at a distance from a larger shopping center is higher as compared to that of an identical property located at the same distance from a smaller shopping center.

Empirical analysis

Data and descriptive statistics

IKEA is often the largest retail establishment to enter a municipality in Sweden, which means that its impact should provide an upper limit on the effect of increased access to higher order retail on place attractiveness. The advantage of using entry by a new IKEA retail area as “treatment” is that it is sufficiently large to act as a positive retail supply “shock” on the local market, and thus, allow us to observe a clear discontinuity point in both space and time, whose effects can be accurately isolated and measured. The studied IKEA entry events are quite similar, and as reported by Rudholm, Li, and Carling (2018), they consist of entry by IKEA itself, the establishment of a surrounding retail area comprising 20–30 other retail stores, approximately 2,500 parking spaces, and convenient location of the retail area relative to major highways. As such, the entry events under study are similar in both size, design of the retail area and choice of additional stores, with the only major difference being the timing of the entry events.

We focus on five IKEA entries in Sweden between 2005 and 2014: namely Kalmar (2006), Haparanda (2006), Karlstad (2007), Uddevalla (2013), and Borlänge (2013), and the entry locations are displayed in Fig. 1. These entry cities are also similar in that they are located at some distance from other IKEA retail areas in Sweden (Fig. 1), and all have less than 100,000 inhabitants. As such, both the type of retail entry and the entry cities are similar, making these entries comparable events.



Figure 1. IKEA retail areas in Sweden, 2019.

We use market prices of single-family residential properties in the entry regions as a proxy for place attractiveness and estimate the changes in these property values that are due to the entry of IKEA. Data on the market prices of single-family properties in Sweden are obtained from Lantmäteriet (The Swedish Mapping, Cadastral, and Land Registration Authority), and include all transactions ($N = 18,163$) that took place in the entry municipalities between 2005 and 2014. We regard the market price of residential properties as an adequate measure for the attractiveness of a specific location because individuals are willing to pay a premium for living in certain locations (Glaeser, Kolko, and Saiz 2001), and amenities explain most of the price variation for residential properties across cities and over time (Rosen 1979; Roback 1982). Previous research shows that the effects of amenities are capitalized in the prices of residential properties much more than, for example, in wage levels (Nilsson 2013).

To avoid any heterogeneity imposed by across-city varying economic conditions (Hwang and Quigley 2006; Pope and Pope 2015), we restrict our sample ($N = 13,497$) to properties located within the city of entry by excluding all properties located more than 10 km from the entry locations. Figures 2 and A1–A4 in Appendix 1 show that this approach is effective and ensures that both preentry and postentry property prices for sold units are located within the same city.

Descriptive statistics for market prices and market prices per square meter, property attributes (area, standard, and age), distance to the IKEA retail area, and indicator variables defining the extent of treatment in time, as well as our treatment variable are provided in Table 2. The area measure is adjusted for additional structures such as garage, sunroom, balcony or unequipped

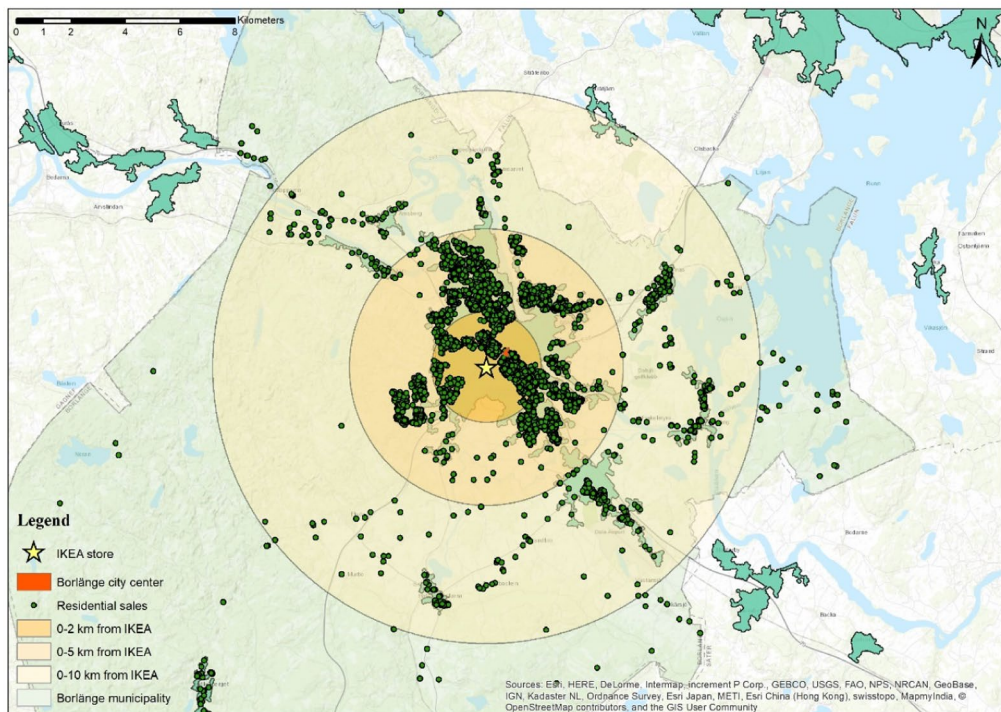


Figure 2. Borlänge – Entry of IKEA retail area (star), 10-km buffer zone, sales of residential properties, and the location of the city center.

Table 2. Variable Definition and Descriptive Statistics

Variable	Variable Definition	Mean			Median			Std Dev			Min			Max		
		Pre-IKEA	Post-IKEA	Post-IKEA	Pre-IKEA	Post-IKEA	Post-IKEA	Pre-IKEA	Post-IKEA	Post-IKEA	Pre-IKEA	Post-IKEA	Post-IKEA	Pre-IKEA	Post-IKEA	Post-IKEA
Price _{it}	Market price (tSEK)	1,488.91	1,808.02	1,375.00	1,700	820.74	1,157.50	63.00	97.00	1,925.00	13,500					
	Market price per sqm (SEK)	11,825.19	13,545.26	11,111.11	13,356.16	6,382.09	8,753.54	847.22	857.14	203,333.30	184,230.80					
ln Price _{it}	Ln of market price per sqm (SEK)	9.27	9.24	9.32	9.50	0.50	0.90	6.74	6.75	12.22	12.12					
	Property attributes:															
X _i	Area (square meters)	127.78	134.87	124.00	132.00	37.32	36.54	18.00	20.00	480.00	510.00					
	Standard	29.62	30.19	29.00	30.00	4.56	4.25	10.00	10.00	54.00	53.00					
dist	Age (years)	56.00	52.88	53.00	50.00	19.28	18.30	8.00	7.00	90.00	90.00					
	Distance to the closest IKEA retail area (km)	4.67	4.79	4.30	4.96	2.38	2.43	0.33	0.35	10.00	10.00					
P	Indicator variable equal to 1 for properties sold after IKEA entry	0	1	0	1	0	0	0	1	0	1					
	Treatment variable equal to P/dist for properties sold after IKEA entry, 0 otherwise	0	0.31	0	0.20	0	0.26	0	0.10	0	2.87					

attic, with these additional spaces adding 20% of their area to the total. The standard of the building is an aggregate index measure that varies between 0 and 54, depending on both the construction materials and the equipment existent in the house.¹ The age is adjusted for improvements, renovations, and extensions; the adjustment is carried out by the Swedish Tax Agency. The distance to the IKEA retail area is calculated in ArcGIS using an Euclidean distance measure.²

The descriptive statistics indicate that the properties included in our sample and sold before IKEA entry have an average market price of 1.4 million SEK (147,802 USD),³ compared to an average of 1.7 million SEK (179,425 USD) for those sold after entry, and an average square-meter price of about 11,000 SEK (1,161 USD) and 13,000 (1,372 USD), for the properties sold before and after entry, respectively. There is, however, almost no change in the attributes of the properties sold before and after IKEA entry: while the average size increases slightly from 124 to 133 square meters, the average standard index is unchanged at 30, and the average age decreases slightly from 53 to 51. The average distance from the properties sold before IKEA entry to the closest IKEA is of 4.33 km, while the average distance is of 4.57 for those properties sold after IKEA entry. City-level descriptive statistics is available in Appendix 3.

Identification strategy and empirical model

To measure the relationship between access to retail trade and place attractiveness, with the latter proxied by residential property values, we need to observe a large exogenous change in access to retail. Pope and Pope (2015) have previously used entry by new Walmart stores in the United States as quasi-natural experiment and combined it with a difference-in-difference within estimation to establish its effect on property values. They included properties located within 2 miles (3.2 km) of the new Walmart store in the treatment group, while properties located between 2 and 4 miles (3.2–6.4 km) away were included in the control group.

By restricting their analysis to properties located in the vicinity of the new Walmart store and performing a within-estimation, Pope and Pope (2015) acknowledged the fact that housing markets are local. Their identifying assumption is thus that housing price trends for areas near the big-box entry and those for areas slightly farther away from the entry location likely would have been the same in the absence of entry.

Following Pope and Pope (2015), we restrict our sample to properties located within the city of entry to avoid any heterogeneity imposed by across-city varying economic conditions. However, initial analysis of the data showed that, contrary to Pope and Pope (2015), there is no clear boundary within the city where the effect of the new IKEA retail area becomes zero. This may be due to the fact that, while effects of grocery-based retailers such as Walmart on property prices are highly localized (Pope and Pope 2015; Slade 2018), higher order retailers like IKEA could have impacts that reach much farther from the entry site (Klaesson and Öner 2014; Öner and Klaesson 2017). Consequently, we cannot make a clear distinction between any “treatment” and “control” groups within the city, and we thus use a within-city analysis of the impact of IKEA entry on property values. Furthermore, as IKEA is likely to establish in regions with positive development trends, ignoring this possibility would make that the estimated effects of IKEA entry on property prices are positively biased in cross-city comparisons, which we avoid by making within-city estimations.⁴

More specifically, we estimate the effects of a new IKEA retail area on the prices of all properties located no more than 10 km from the entry locations.⁵ The sales of residential properties in Borlänge are displayed in Fig. 2, showing that the 10 km restriction ensures us that all properties

are located within the same urban area. We have also marked the 2 and 5 km buffers to give the reader a visual illustration of the number of sales at different distances from IKEA.⁶

In spite of the fact that IKEA established stores at different times in the five entry cities, the number of sales is fairly constant before and after IKEA entry. Table 3 illustrates the number of sales within 10 km of the new entry and the respective proportions out of total sales by city and year. The data show that the proportions do not drastically change over the years. The data also indicate that the analyzed municipalities are fairly similar when it comes to the distribution of the total sales among them, with the exception of Haparanda, which is smaller.

As discussed in section 3, the relationship between distance to large retail areas and property prices is likely to be nonlinear. We, therefore, estimate a model that takes into account how the effect of IKEA entry depends on the distance to the new IKEA retail area. More specifically, our base-line model specification (model 1) can be written:

$$\ln \text{Price}_{\text{imt}} = \beta_0 + \beta_1 TR + \beta_2 TR^2 + \delta_t + \gamma_m + (\delta_t \times \gamma_m) + \varepsilon_{\text{imt}}, \quad (1)$$

where $\text{Price}_{\text{imt}}$ is the market price per square meter for a single-family residential property i , located in municipality m , sold during year t ; β_0 is a constant term; TR is our treatment variable and it is described in detail below. As we do not have access to any city-specific control units as Pope and Pope (2015), it is essential to control for both time- and city-specific heterogeneity. As such we include δ_t which is a year-specific fixed effect included to adjust for time-variant heterogeneity given by, for example, nationwide trends in property values, such as the crisis of 2008–2009; and γ_m which is a city-specific fixed effect to control for any city-specific heterogeneity. However, the lack of city-specific control units also makes it important to account for any city-specific shocks that could affect property values. The interaction $(\delta_t \times \gamma_m)$, thus, represents city-year specific fixed effects, controlling for potential city-year specific shocks to the local real-estate market. These city-year specific fixed effects thus controls for all city-year specific heterogeneity, including city specific inflation, secular trends, or other time specific shocks to

Table 3. Number of Sales Within 10 km of the New Entry, and Proportions of Total by City and Year

Year	Kalmar		Uddevalla		Karlstad		Borlänge		Haparanda		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
2005	312	25.57	210	17.21	311	25.49	318	26.07	69	5.66	100.00
2006	294	26.97	202	18.53	291	26.70	239	21.93	64	5.87	100.00
2007	276	21.82	246	19.45	333	26.32	332	26.25	78	6.17	100.00
2008	254	20.99	244	20.17	375	30.99	297	24.55	40	3.31	100.00
2009	331	27.65	208	17.38	331	27.65	285	23.81	42	3.51	100.00
2010	257	20.46	221	17.60	406	32.32	330	26.27	42	3.34	100.00
2011	257	21.22	178	14.70	478	39.47	255	21.06	43	3.55	100.00
2012	270	16.57	232	14.24	798	48.99	284	17.43	45	2.76	100.00
2013	298	25.40	225	19.18	308	26.26	290	24.72	52	4.43	100.00
2014	181	22.85	158	19.95	220	27.78	208	26.26	25	3.16	100.00
Total	2,730	22.67	2,124	17.64	3,851	31.98	2,838	23.57	500	4.15	100.00

Note: Years after IKEA entry in bold.

local property prices. The estimated effect should thus be interpreted as the impact of IKEA entry on property values, holding all other independent variables including these city-year specific fixed effects, constant. Finally, the equation contains a random error term assumed to have zero mean and constant variance (ϵ_{imt}).⁷

Our variable of interest is $TR = P/dist$, where P is an indicator variable equal to 1 after IKEA entry and 0 otherwise; and $dist$ is the distance to the IKEA retail area, in km. TR is thus 0 for the properties sold within the city of entry, before entry, and equal to the inverse of distance to the IKEA entry site, after entry. TR will thus provide an estimate of how market prices of properties in the city of entry change after entry, while controlling for city and year level heterogeneity, but also for city-year specific shocks. A positive and statistically significant parameter estimate for TR would indicate an increase in property prices due to IKEA entry.⁸ If property prices increase more in locations close to where we have entry, then, access to a retail trade area can be considered an amenity that adds to the attractiveness of the location.

In order to correct for the possibility that some of the property characteristics may be different in the treatment and control group, we also estimate a second model where we add a vector of variables \mathbf{X}_i that includes structural characteristics of the analyzed properties. Variables that are included in the vector \mathbf{X}_i are the area of the property (measured in square meters), the standard of the property, and the age of the property. As such, this model control not only for city and year level heterogeneity and city-year specific shocks, but also for differences in the attributes of the properties sold.

Results

The coefficients corresponding to our treatment variable (TR) illustrate the effects of entry by IKEA on property prices at various distances from the entry locations. The log transformation of property prices ($\ln Price_{imt}$) has the benefit of making these parameter estimates interpretable in percentage terms after using the formula $100 \times [\exp(\hat{\beta}_{TR}) - 1]$ (Wooldridge, 2010). These treatment effects in percentage terms are presented in Table 4.

The average change in residential property prices within the city of entry when IKEA enters is 4.23%. This result is equivalent to an average increase of 500 SEK (52 USD)⁹ in the pre-IKEA average price per square meter for properties located within 10 km of new IKEA retail areas. This translates to an increase 62,980 SEK (approximately 6,600 USD) in the total price of the average house located within 10 km of a new IKEA retail area.

Table 4. Estimated Impact of IKEA on Residential Property Values

	Model 1		Model 2	
Distance (km)	Treatment Effect (SE)	P Value	Treatment Effect (SE)	P Value
4.45 (average)	4.23%***	0.002	4.31%***	0.002
1.00	2.84%	0.269	2.80%	0.275
1.50	6.55%***	0.008	6.65%***	0.007
2.00	6.65%***	0.003	6.77%***	0.003
5.00	3.86%***	0.002	3.94%***	0.001
10.00	2.11%***	0.002	2.16%***	0.001
No. obs.	12,035		12,035	

***Significant at the 1% level.

**Significant at the 5% level.

*Significant at the 10% level.

However, the estimated effect of IKEA entry is not significantly different from zero for the properties that are located 1 km away from the new IKEA retail area, while the prices of properties located beyond 1 km are positively affected when IKEA enters the city. Prices of properties located at 1.5 km away from the entry location increase by, on average, 6.55% when IKEA enters. The positive association between IKEA entry and property prices reaches a maximum (6.65%) at about 2 km from the new IKEA retail area, and then, decreases smoothly so that properties located 10 km away from the entry location experience an average price increase of only about 2% when IKEA enters the city (Fig. 3).

To give an idea about how well Model 1 describes the available data, Table 5 contain information on the property values predicted by our quadratic model, actual property values, and the difference both in SEK and in percent. The results show that the quadratic model is good at predicting the price data, except at distances more than 7.5 km from the new IKEA. For distances shorter than 7.5 km from the new IKEA, the deviation of the true average property price from the predicted average price for the model ranges from 1.8 to 6.2 percent. For distances above 7.5 km from the new IKEA, the model overestimates the price by some 1,500 SEK per square meter, which equals an overestimation by approximately 20 percent on average. However, when also doing the comparison for the median property price rather than the average at this distance, the overestimation is reduced to less than 2.8 percent, and the overestimation is thus clearly caused by a few properties being sold at prices considerably below the median at this distance from IKEA.

The results from model 2 show no large changes in the coefficient estimates, indicating that the treatment effect variable is not correlated with the property attributes to any significant extent. Thus, removing these variables from the estimated model have not caused any significant missing variable bias (Studenmund 2014). Finding that the estimates of the treatment effect do not alter when we remove these variables from the regression also provides support for the claim that the attributes of the houses in the entry regions do not change in any major way at the time of IKEA entry. Otherwise the variables defining these characteristics (X_i) would have been correlated to the treatment effect variable and caused, when removed from the regression, omitted variable bias, altering the estimate of the treatment effect.

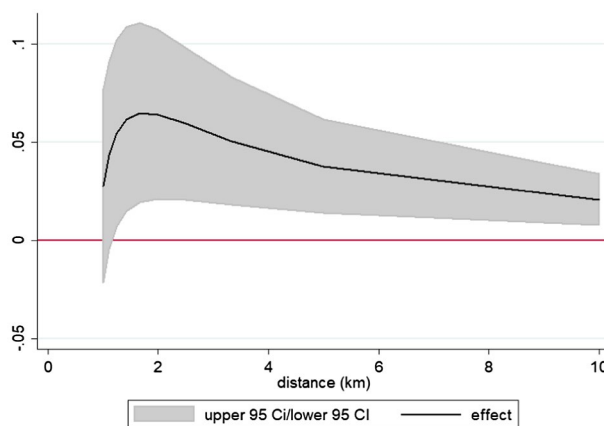


Figure 3. Impact of IKEA entry on residential property values depending on distance from the entry location, point estimates and 95% confidence interval.

Table 5. Average and Predicted Prices at Different Distances for Model 1

Distance (km)	Distance Interval (km)	Average Price per sqm	Average Predicted Price per sqm	Difference	Difference (%)	No. Obs.
1.00	0.50–1.25	8,566	8,719	153	1.78	434
1.50	1.25–1.75	9,021	9,525	504	5.59	826
2.00	1.75–3.50	10,839	10,570	–269	–2.48	3,506
5.00	3.50–7.50	11,951	11,205	–746	–6.24	5,232
10.00	7.50–10.00	7,471	9,009	1,538	20.59	2,008

Concluding remarks

The purpose of our study has been to investigate if better access to retail activities can increase the attractiveness of a location, using the entry of IKEA in Sweden as a quasi-natural experiment. An IKEA retail area is often the largest retail establishment to enter a city, which means that it can be considered a positive shock that significantly increases the access to higher order retail in the local market. The estimated effects of IKEA entry on property values can thus be considered as an upper limit for the possible effects of increased accessibility to retail. In agreement with the agglomeration theories, if the positive spillovers from increased accessibility to retail overcome any negative externalities, then, retail activities can be considered a consumer amenity and entry by IKEA should have a positive impact on the prices of residential properties.

We have followed theoretical arguments and previous research on the effects of large retail establishments (Hwang and Quigley 2006; Pope and Pope 2015; Slade 2018) by restricting our sample to properties located within the city of entry, which allows us to avoid any heterogeneity imposed by across-city varying economic conditions. Using a time series model, we then estimate how the effect of IKEA entry depends on the distance to the new IKEA retail area.

We find that the average change in residential property prices within the city of entry is 4.23% following the entry by IKEA. This result is equivalent to an average increase of 500 SEK (52 USD)¹⁰ in the pre-IKEA average price per square meter for properties located within 10 km of new IKEA retail areas. This translates to an increase 62,980 SEK (approximately 6,600 USD) in the total price of the average house located within 10 km of a new IKEA retail area. The direction of the effect is in line with previous studies indicating positive effects following the establishment of large retail areas (e.g., Sirpal 1994; Des Rosiers et al. 1996; Van Fossen 2017).

Our results indicate a nonlinear association between IKEA entry and residential property prices, in the form of an inverse U-shape with a long tail. Prices of properties located at 1 km away from a new IKEA retail area were not significantly impacted by the new entry, while prices of properties located beyond 1 km of the new IKEA retail area experienced a positive association that dissipates with distance. Prices of properties located at 1.5 km away from the entry location site increased by, on average, 6.55% when IKEA entered the local market. The association between IKEA entry and property prices reached a maximum at about 2 km from the IKEA at 6.65%, and then, decreased smoothly so that properties located 10 km away from IKEA experienced an increase of only about 2%.

To further investigate the robustness and precision of our estimations, we perform proximity band estimations (0–2, 2–5, and 5–10 km) and compare these results to the ones presented in the main part of the article (for the full set of results see Appendix 2). The proximity band estimations result in slightly higher estimates of the association between IKEA entry and property values, but all estimates show a positive effect of IKEA on property values, and that the effect increases from low levels very near the new IKEA, reaches a peak somewhere between 2 and 5 kilometers from new IKEA, and then, the positive impact fades away as distance increases. Furthermore, comparing the predicted property values from our model and to the actual ones in the data indicate that the original model predicts the true property values well, except perhaps at distances over 7.5 kilometers from the new IKEA. As such, we are confident that the main message of our article, that IKEA entry increases property values in the cities where they enter, is correct, although the exact size of the effect is more difficult to determine.

Our research thus suggests that positive and negative externalities generated by the entry of a higher order retailer like IKEA cancel each other out and end up in a zero-sum game close

to the entry location. The negative costs of locating close to a higher order retailer seem to be higher in its direct vicinity than for lower order retailers such as Walmart. At a longer distance from the IKEA entry location the negative costs generated by, for example, increased traffic, noise and light pollution, seem to subside. Several studies (Corlija, Siman, and Finke 2006; Aliyu, Kasim, and Martin 2011) report similar patterns, with no or even negative effects of entry by new shopping centers close to the entry sites, then, turning positive and increasing up to some maximum value, after which the impact decreases with distance. This is different from the results of studies focused on grocery-based stores, which seem to indicate that the positive externalities are larger in the immediate proximity of the new establishment (Addae-Dapaah and Lan 2010; Pope and Pope 2015; Van Fossen 2017; Slade 2018). Another difference between our study and most previous studies is, however, that the effects have a slower distance decay and does not turn zero within the entry cities. As such, it seems that a higher order retailer like IKEA has an impact on residential property values in a larger part of the local market than does a new Walmart or supermarket. As for the size of the effect, our results regarding the average impact in the entry cities, occurring at 4,5 kilometers (approximately 3 miles), translates to a positive impact of 6,600 USD. This finding is in line with the results reported by Pope and Pope (2015), who found a premium of 7,000 USD for properties within half a mile of a new Walmart, and by Van Fossen (2017), who found a premium of 6,000 USD for every additional supermarket within a 3-mile radius of the analyzed neighborhoods.

Our results have a series of implications for local policymakers. First, previous studies have found that entry of IKEA increases total durable good sales and number of employees within the municipality and has positive spill-over effects on incumbent retailers in terms of both productivity and sales. However, the economic significance of these results does not seem to motivate the large investments that local policymakers often are willing to undertake in order to attract IKEA to their municipality (Daunfeldt et al. 2016; Han et al. 2018; Håkansson et al. 2019). Nevertheless, our results indicate that there may be other benefits that can motivate such investments as access to higher order retailing also increases the attractiveness of the location. Attractive places are known to have the power to further draw businesses and investments, and a skilled work force, and thus, grow faster than their less-attractive counterparts (Glaeser, Kolko, and Saiz 2001).

We can thus conclude that IKEA creates favorable conditions for the development of the entry regions, in spite of the fact that big-box stores are often perceived as the seed of degradation in their entry areas. Popular science journals have over the latest years published a large number of articles showing peoples' concern over the possible negative effects of large retailing—e.g., “America learns to hate Wal-Mart” (Walsh 1999); “New Rochelle residents turn out in force to block IKEA” (Mitchell 2001); “IKEA expansion plan irritates Emeryville residents” (Maher 2010). However, our results provide scientific evidence against these NIMBY (Not In My Back Yard) reactions, showing that these almost overwhelmingly negative reactions of residents in entry areas to big-box entry are not justified. The effects of IKEA are in the worst-case scenario not significant (in the immediate vicinity of the new stores), and they even turn positive at 1.5 km from the new stores.

Our research does not come without limitations. First, our identification strategy will capture all other changes that occurred simultaneously with the entry of IKEA, such as infrastructure investments that come with the establishment of a new IKEA retail area. Our results should, therefore, be interpreted as a general equilibrium reduced-form effect that combines the impact

of a new IKEA retail area and all other changes in the local market that are associated with the entry by IKEA (Greenstone, Hornbeck, and Moretti 2010).

IKEA entry is furthermore not a representative event. On the contrary, it is most likely the largest entry of a higher order retailer to ever occur in a Swedish city. Our estimates should, therefore, be interpreted as an upper bound compared with the effects of retail firm entry on place attractiveness in general. Moreover, local policymakers tend to partly finance the entry by IKEA. Consequently, we expect those municipalities that offer the largest subsidies to be more likely to get a new IKEA retail area, but also be the ones that benefit most from IKEA entry. Our results thus should be interpreted as impacts of a new IKEA retail area on residential property prices in the municipalities that IKEA chooses to enter, and any generalization of our results beyond that should be undertaken with caution.

Future studies should aim at extending the external validity by, for example, looking beyond IKEA at the effects of shopping centers of various sizes and characteristics on the attractiveness of the entry locations. One such characteristic could be the recent trend toward brand shopping, which can certainly have an impact on property values, and with a different distance decay pattern with respect to property values compared to prize-minimization shopping. Also, we have not found any previous studies investigating the impact of IKEA on property values in other countries, but the impact on property values and its distance decay pattern could certainly differ also between countries. Country comparisons of the effect of different types of big-box retail entry on residential property values is thus also an interesting subject for future research.

Acknowledgements

Research funding from the Hakon Swenson Foundation (grant number 2016003) is gratefully acknowledged.

Notes

- 1 These calculations and the standard index are all done by Lantmäteriet (The Swedish Mapping, Cadastral, and Land Registration Authority).
- 2 We have excluded outliers larger or smaller than 3 standard deviations for market price per square meter to minimize potential bias from errors and non-arm's-length transactions, which tend to be common when working with property values (Pope and Pope).
- 3 Exchange rate of 1 USD = 9.47 SEK, 8 March 2019.
- 4 We did make an effort to find suitable control cities using propensity score matching but failed to find cities with similar pre-entry trends as the entry cities and the suggested control cities also differed with respect to other characteristics. As such, we decided to use the within estimations described below.
- 5 Note that using a smaller buffer around the new IKEA would mean excluding properties that were affected by the new IKEA, creating bias in the estimates of the effect. Likewise, increasing the area around the entry sites above 10 km would lead to including properties in other cities in the analysis, which would also bias the estimates of the entry city effect. As locations, very near the new IKEA are not zoned for residential property, we have also excluded sales within 500 metres of the new IKEA.
- 6 The corresponding 2, 5, and 10 km buffer zones for the other cities of entry (Haparanda, Kalmar, Karlstad, and Uddevalla) are presented in Figures A1-A4 in Appendix 1.
- 7 To mitigate possible heteroskedasticity problems, we estimate Equation (1) using White (1980) heteroskedasticity robust standard errors. We also investigated potential problems with multicollinearity by checking the correlations between the independent variables as well as their variance inflation factors. The correlations between TR and TR-squared is 0.82, and for Model 1 the variance inflation factors for the parameter estimates related to TR and TR-squared were 7.77 and 4.74, respectively, which is well

- below the commonly used rule of thumb of 10 (Kutner et al. 2004). As such, we do not consider multicollinearity to be an issue in these estimations.
- 8 Since IKEA entry happens at different points in time in different cities it is likely that the estimated effect is due to IKEA, and not due to other events. The alternative is that there is some non-IKEA-related event that happen simultaneously with IKEA entry in some or all of the five entry cities, and that is sizeable enough to positively affect property values. We are not aware of any such events, and since the entry cities are small to medium sized Swedish cities, we find it unlikely that there are such events that we have not heard of.
- 9 At an exchange rate of 1 USD = 9.53 SEK, 3 December 2019.
- 10 At an exchange rate of 1 USD = 9.53 SEK, 3 December 2019.

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Appendix 1. Entry locations

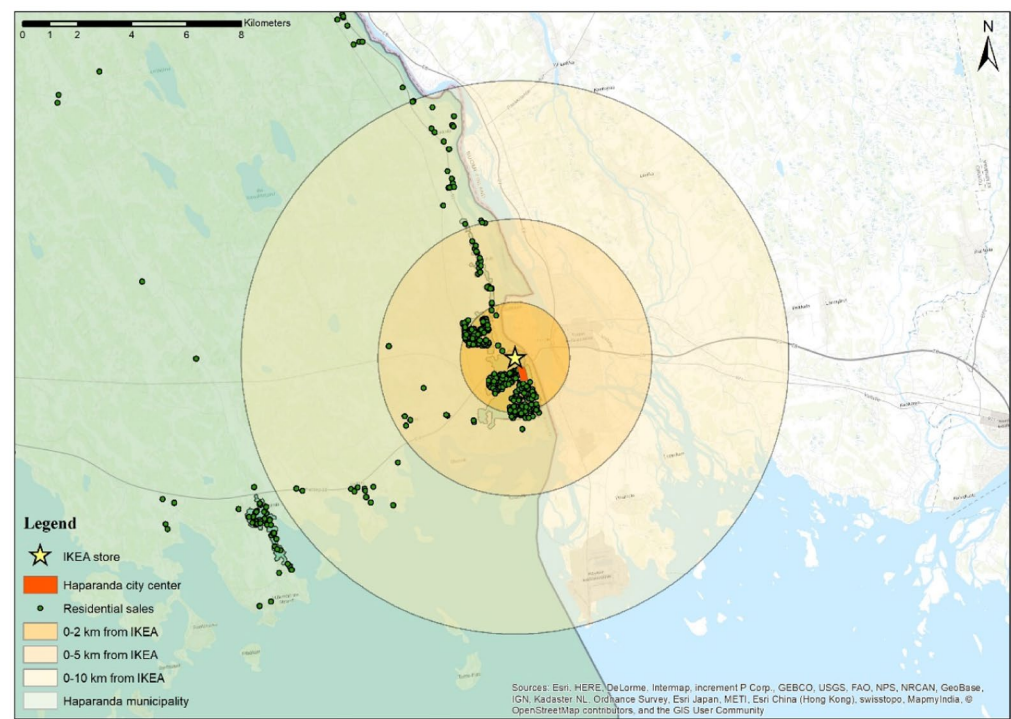


Figure A1. Haparanda - Entry of IKEA retail area (star), 2, 5, and 10-km buffer zones, sales of residential properties, and the location of the city center.

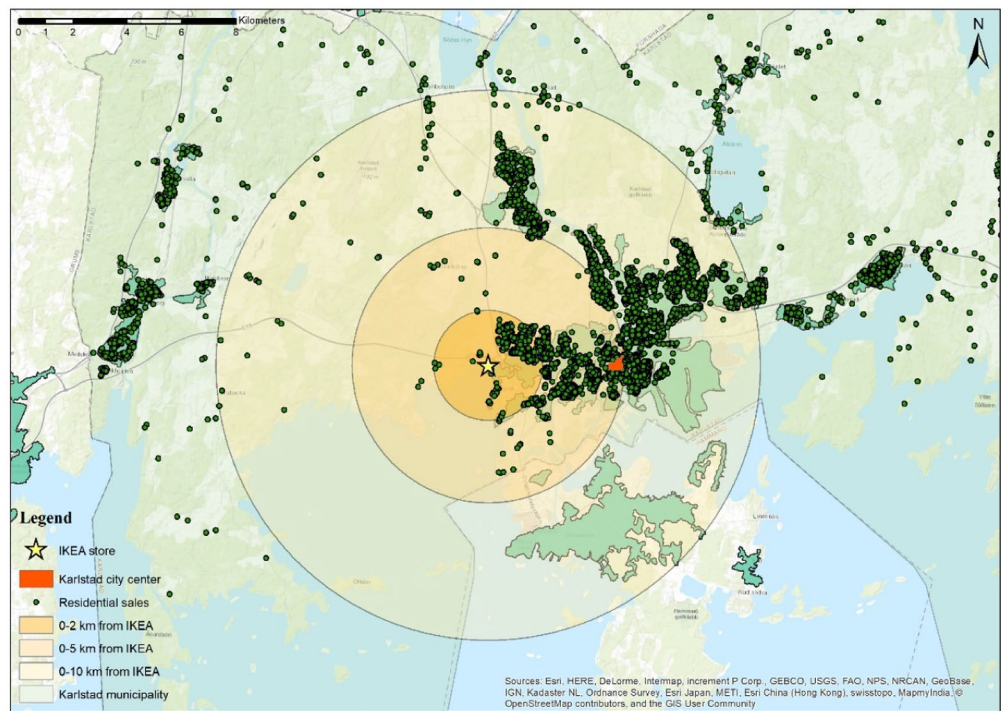


Figure A2. Karlstad - Entry of IKEA retail area (star), 2, 5, and 10-km buffer zones, sales of residential properties, and the location of the city center.

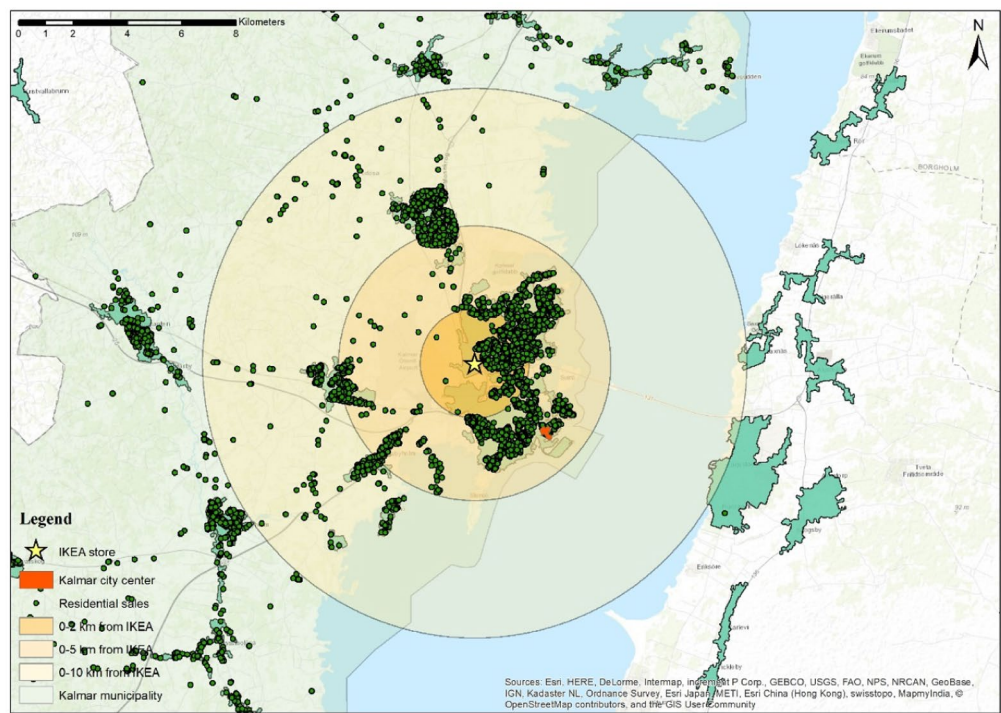


Figure A3. Kalmar - Entry of IKEA retail area (star), 2, 5, and 10-km buffer zones, sales of residential properties, and the location of the city center.

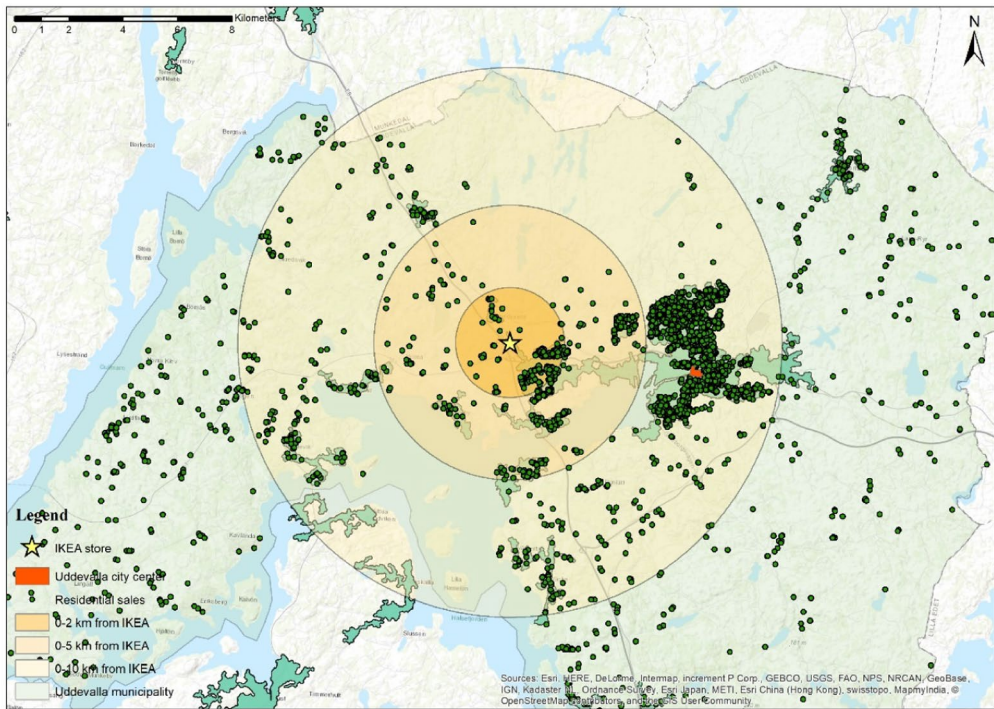


Figure A4. Uddevalla - Entry of IKEA retail area (star), 2, 5, and 10-km buffer zones, sales of residential properties, and the location of the city center.

Appendix 2. Robustness estimations using proximity bands

In the main part of our article, a quadratic distance decay function is used as it predicts the available data well (Table 3) and also makes it possible to present our results pedagogically as in Figure 3. However, to make sure that this distance decay function is not overly simplistic, we have re-estimate Equation (1), but instead of having one distance decay for all observations, we now divide the data in proximity bands depending on the distance from IKEA. In our main robustness test estimation presented below, we do this for three bands, 0–2, 2–5 and 5–10 km.

In initial estimations, we estimated both linear and quadratic distance decay parameters within each buffer. However, correlation coefficients between the linear and quadratic treatment variables and variance inflation factors both indicated multicollinearity, with correlations between TR and TR-squared in the range of 0.87 to 0.98 and variance inflation factors reaching as high as 66, which is well above the commonly used rule of thumb that VIFs should be below 10 (Kutner et al. 2004). After excluding the squared terms from the model, the VIFs are all below 10, and the robustness test model finally used can be written:

$$\ln \text{Price}_{\text{int}} = \beta_0 + \beta_1 \text{TR02} + \beta_2 \text{TR25} + \beta_3 \text{TR510} + \delta_t + \gamma_m + (\delta_t \times \gamma_m) + \varepsilon_{\text{int}},$$

where TR02 is the treatment variable described in the main text of the article, but now for a 0–2 km proximity band around the new IKEA. TR25 and TR510 have a similar definition, but now for 2–5 and 5–10 km proximity bands.

After the estimation of this regression equation, we evaluate the effect of IKEA on prices at the average distance to the new IKEA within each buffer. If the quadratic distance decay function

used in the main text of the article is a good representation of the data, the results from the proximity band estimations at different distances from IKEA will be similar to those presented in the main text. The estimated treatment effects from the proximity band estimations are presented in Table A1.

We can then compare the results from these proximity band estimations to those obtained when using our original model with the quadratic treatment effect function. The average estimated effect in the 0–2 km buffer equals 6.39%, which can be compared to the effect at 1.5 km in the main estimations where the effect equals 6.55%, which is very similar. The largest difference is in the 2–5 km range, where the proximity band estimations suggest an increase in prices reaching about 10%, while the quadratic distance decay suggest increases between 4% and 7%. Finally, in the 5–10 km proximity band the impact on property values is approximately 5% while the main estimations instead suggest increases in the range of 2.1% to 2.2%.

As such, the estimated effects when using proximity bands and a linear distance decay within each band suggests a somewhat higher impact than our original estimations, but the impact on property values follow the same general curvature, with a positive peak in the middle buffer and very lower effects on properties located either very near or far away from the new big-box store.

Furthermore, Table A2. offers an indication of how many sales have been registered within each of the three buffer zones used in the robustness check estimations, by city. The data indicate that the proportion of sales distributes quite evenly between the analyzed municipalities, with the exception of Haparanda, which is smaller and where consequently a lower number of sales are recorded outside the 2 km buffer.

Table A1. Estimated Impact of IKEA on Residential Property Values, Proximity Band Estimations

Distance (km)	Model 1		Model 2		No. Obs. Within Zone
	Treatment Effect (SE)	<i>P</i> Value	Treatment effect (SE)	<i>P</i> Value	
0–2 km	6.39%***	0.002	6.04%***	0.004	1,888
2–5 km	10.47%***	0.000	10.81%***	0.000	4,451
5–10 km	5.65%**	0.015	5.04%**	0.029	5,696
No. obs.	12,035		12,035		12,035

***Significant at the 1% level.

**Significant at the 5% level.

*Significant at the 10% level.

Table A2. Number of Sales Within 0–2, 2–5, and 5–10 km from IKEA, by City

	Kalmar		Uddevalla		Karlstad		Borlänge		Haparanda		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
0–2 km	338	17.90	198	10.49	442	23.41	520	27.54	390	20.66	1,888
2–5 km	1,528	34.33	297	6.67	803	18.04	1,751	39.34	72	1.62	4,451
5–10 km	864	15.17	1,629	28.60	2,604	45.72	563	9.88	36	0.63	5,696
Total	2,730	22.68	2,124	17.65	3,849	31.98	2,834	23.55	498	4.14	12,035

Appendix 3 City-level descriptive statistics

Table A3. City-Level Descriptive Statistics

Variable	Variable Definition	Kalmar		Uddevalla		Karlstad		Borlänge		Haparanda	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Market price (tSEK)	Market price (tSEK)	1,754.36	1,035.72	1,708.97	965.47	1,615.73	862.82	1,330.46	584.26	662.48	296.18
Price _{it}	Market price per sqm (SEK)	12,849.22	6,084.84	13,930.88	8,997.73	11,588.68	5,108.31	10,738.43	4,292.76	5,700.65	1,985.16
ln Price _{it}	Ln of market price per sqm (SEK)	9.36	0.45	9.43	0.49	9.20	0.71	9.21	0.39	8.58	0.38
X_i	<i>Property attributes:</i>										
	Area (square meters)	137.03	41.98	126.44	36.89	138.98	37.09	126.21	35.21	116.78	30.82
	Standard	30.29	4.43	29.04	4.71	29.97	4.34	29.92	4.42	30.15	3.93
	Age (years)	55.66	19.34	55.27	18.87	54.60	16.37	57.01	19.61	47.43	16.86
	Distance to the closest IKEA retail area (km)	3.90	1.54	5.90	2.04	5.56	2.36	3.36	1.74	1.57	0.50
P	Indicator variable equal to 1 for properties sold after IKEA entry	0	0	0	0	0	0	0	0	0	0
TR	Treatment variable equal to $P/dist$ for properties sold after IKEA entry, 0 otherwise	0	0	0	0	0	0	0	0	0	0

(Continues)

Table A3. (Continued)

Variable	Variable Definition	Kalmar		Uddevalla		Karlstad		Borlänge		Haparanda	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Market price (SEK)	Market price (tSEK)	2,130.93	1,188.87	2,035.93	855.59	1,667.67	1,151.48	1,754.53	605.75	799.62	317.90
$Price_{it}$	Market price per sqm (SEK)	16,108.08	9,902.43	15,990.01	5,376.63	12,076.41	8,011.47	13,743.26	3,855.10	6,622.64	2,581.76
$\ln Price_{it}$	Ln of market price per sqm (SEK)	9.53	0.61	9.62	0.37	9.00	1.10	9.49	0.28	8.73	0.37
X_i	Property attributes:										
	Area (square meters)	136.02	36.71	130.25	38.66	137.19	34.26	129.37	35.31	124.42	36.68
	Standard	30.63	4.45	29.26	4.66	30.00	3.91	30.38	4.15	30.27	4.14
	Age (years)	53.52	18.83	54.59	20.60	52.14	16.75	55.48	20.48	49.48	15.05
$dist$	Distance to the closest IKEA retail area (km)	3.86	1.56	5.76	2.02	5.64	2.52	3.41	1.67	1.62	0.66
P	Indicator variable equal to 1 for properties sold after IKEA entry	1	0	1	0	1	0	1	0	1	0
TR	Treatment variable equal to $P/dist$ for properties sold after IKEA entry, 0 otherwise	0.34	0.27	0.22	0.16	0.26	0.21	0.37	0.21	0.72	0.30